

### About E3G

E3G is an independent, not-for-profit climate change think tank. E3G has been engaging on issues of energy system decarbonisation for over 15 years and has expertise on areas including political economy, governance, green and sustainable finance, and energy system decarbonisation. Evidence submitted reflects these areas of focus and specialisation.

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### Summary of key points

The proposal to introduce a Future System Operator (FSO) must be viewed in the broader context of governance reform to deliver net zero. This needs to involve a robust and transparent process to identify what needs to be delivered coupled with clear mechanisms to ensure effective delivery. The FSO will have an important role to play in both regards.

Government must ensure effective delivery mechanisms are in place across the full range of energy infrastructure. This is not currently the case, especially regarding efficiency and heat decarbonisation in buildings. The mandates imposed on Ofgem will be important. These must ensure money is not wasted on catering for numerous potential future pathways and more flexibility is allowed in terms of the allocation of costs and benefits.

Whilst specific delivery responsibilities of the FSO will be limited to ensuring safe and secure power system operation, the services required to achieve this objective (e.g. storage, flexibility, interconnection) will form an increasing part of consumer bills. Government should consider imposing specific mandates on the FSO that will ensure these services are procured ahead of need and consumers are not exposed to excessive volatility in energy prices.

The strategic policy process for deciding long-term infrastructure investments is critical. Whilst the FSO will be well-positioned to provide energy system modelling to support this process, a wider governance reform will be needed to deliver the strategic consensus that can drive forward the energy system transition. The assumptions adopted about the future evolution of technology and consumer behaviour will be critical and these should be produced by an independent body with unbiased expertise across the energy system. Of equal significance is the way analysis is used to support high quality strategic decisions. Independent expertise in strategic decision making is also required. We have concluded that an independent institution with different capabilities from the FSO will be needed to fulfil these two key functions.

### The net zero delivery challenge

Delivering a net zero economy will involve a technological, business, and behavioural transformation, and will take several decades to achieve. Major changes are inevitable over these timescales. For example, digitalisation and the adoption of artificial intelligence systems will radically alter the way we live. The net zero delivery challenge is to harness the inherent drivers for technological and cultural evolution, accelerating and opening new pathways for positive change whilst tackling forces that preserve the status quo. It will involve making decisions in the face of a highly uncertain future and intensive lobbying from

various powerful special interest groups. Above all, it must result in outcomes that makes lives better and achieve this in a fair and equitable way.

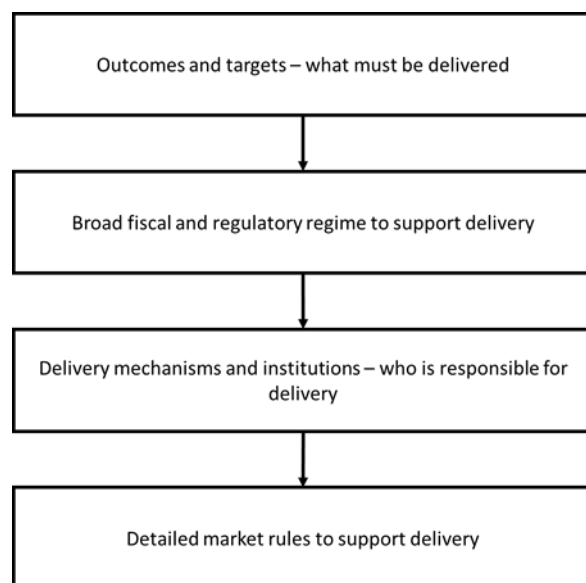
Effective net zero governance systems are required to support consistent political leadership and timely policy making out to 2050. This means they must provide:

1. Strong evidence that policy action is needed and which course of action to take, and
2. Confidence that effective mechanisms are in place that will deliver the ambitious changes required.

The proposal to establish a Future System Operator (FSO) must be considered in this broader context. It is necessary to consider the roles proposed for the FSO, the extent to which they are needed, and the other functions and interfaces that are required to ensure it functions effectively and efficiently. Failure to establish an effective overall governance system that commands public support risks creating political bear-traps that could undermine progress towards net zero.

### Model for net zero delivery governance

Net zero governance will involve a wide range of functions allocated between many organisations and a key challenge will be to maintain coherence in policy decisions across all sectors of the economy and throughout the delivery process. Without this, delivery costs will escalate because of policy cannibalisation and costs of capital will increase as private actors seek to manage policy risk. The chart below illustrates the key elements in this policy and delivery process.



Top-level decisions will need to be made about what must be delivered and by when. This includes an overall greenhouse gas emission envelope along with a range of sub-targets relating to technology deployment, inward investment, and social impacts. It will also be necessary to establish the suite of fiscal and regulatory measures such as taxes, subsidies, and standards, that support delivery of these outcomes. These are important political choices since they define the trade-offs between different sections of society now and into the future. Only government has the democratic mandate to make these decisions.

Setting targets and supporting policies is insufficient to deliver net zero. In energy, complex administered markets are needed to ensure an efficient supporting infrastructure is in place and supply always matches demand. This, in turn, requires dedicated institutions to design and operate the markets. Also, national

policies do not reflect different local conditions and additional incentives will be required to deliver outcomes in a way that is acceptable to local communities. Central government must, therefore, delegate the responsibility for some aspects of delivery to other institutions and they, in turn, must design detailed mechanisms to ensure outcomes are delivered.

The government has recently published a raft of policy documents aimed at delivering a net zero energy system. These included a Smart Systems and Flexibility Plan, a Retail Markets Strategy, and a Hydrogen Strategy. A Heat and Buildings Strategy is expected to appear shortly. These documents confirm that government is in the process of changing all levels of the policy hierarchy described above. Key outcomes are still to be defined, such as those relating to affordability and fairness which will be the subject of a future call for evidence. Although a new framework for, and a recent first issuance of, green gilts have been launched, alongside a new UK Infrastructure Bank with a net zero mandate and scope for offering local authorities technical assistance, HM Treasury has not completed a review of how net zero delivery should be financed, let alone set out how specific mechanisms will combine to achieve this goal. There is going to be an overhaul of delivery institutions – not just the creation of an FSO. Ofgem could get a new strategic responsibility for designing electricity and gas trading arrangements, distribution network operation will be reviewed, and the forthcoming Heat and Building Strategy is likely to set out new responsibilities for local authorities. More broadly, but as yet undefined, the levelling up agenda is likely to reorient relationships between Whitehall and local authorities. Meanwhile, important changes in market rules are being considered, most notably those relating to the planning of power networks and how these costs are recovered. This level of change should not be viewed as a unique situation. The policy framework will always need to evolve, and government must be prepared to initiate bold and transformative reforms when they are required. The challenge for net zero governance is to ensure policies are mutually reinforcing and combine to manage risks on the journey to zero greenhouse emissions.

The proposed functions for the FSO involve some delivery and market design responsibilities relating to the safe and secure operation of the power system. Much of the FSO activities, however, involve supporting target setting by Government and other delivery functions such as Ofgem, the residual parts of National Grid, and the distribution network operators. It is also proposed that these initial functions might expand over time. The following sections consider the delivery and support functions separately.

### FSO delivery responsibilities

Certain required outcomes will not be reliably achieved by the fiscal and regulatory measures set by Government. In these circumstances, it is necessary to identify a responsible delivery body and impose an appropriate statutory mandate. Ensuring the power and gas systems work in the interests of consumers is one such requirement and this responsibility rests largely with Ofgem. Ofgem establishes a suite of licences to 'sub-contract' delivery to a range of organisations. National Grid Electricity System Operator (ESO) currently has responsibilities relating to the safe and secure operation of the power system (e.g. maintaining system frequency within certain limits) and designing and operating markets to bring forward some of the services needed to fulfil these objectives (commonly termed ancillary services). It also plays a role in operating other markets (capacity market, energy balancing market via Elexon). It is proposed that the FSO initially takes on these current responsibilities.

FSO responsibilities are, therefore, part of a much broader landscape and it is necessary to:

- > Ensure that all outcomes necessary to achieve a net zero energy system will either be delivered by mechanisms established by Government or that an appropriate delivery body has been mandated to design and implement additional delivery mechanisms.
- > Allocate these additional responsibilities to the organisation that will fulfil the functions in an efficient and effective manner.

The net zero delivery challenge is significant. Huge increases in renewable generation capacity will be required, heat and transport demand must be electrified – alongside improvements in energy efficiency and a major rollout of district and communal heating – and grid networks upgraded accordingly. In addition, new infrastructure to capture, transport and store CO<sub>2</sub>, and produce and transport hydrogen, are likely to be needed. The statutory mandates currently given to delivery bodies do not reflect all these requirements and the Government is often relying on centrally determined measures to achieve outcomes. Whilst this approach has proved effective in expanding renewable generation capacity<sup>1</sup>, it has failed in other areas. Most notably, there is no effective delivery mechanism in place to achieve improvements in energy efficiency and heat decarbonisation of the built infrastructure.

The mandate applied to Ofgem is especially important. This has remained largely unchanged since privatisation and does not reflect the major changes associated with delivering net zero. Whilst the current management team is evidently focused on decarbonisation of the energy system, it is not able to make choices about future technology pathways. This means that it must ensure an infrastructure is in place that caters for a wide variety of outcomes, including delivery failure. For example, the absence of clear delivery mandates for heat decarbonisation has created huge uncertainty that must be managed. Moreover, it has little flexibility in how costs of investments are allocated across society and is essentially restricted to increases in energy bills. It is under strong pressure to avoid such increases given the impacts on poorer consumers and the mismatch between those paying and those benefiting. This situation is likely to become more serious with the potential need for expensive infrastructure investments in CO<sub>2</sub> and hydrogen systems.

The absence of clear delivery mandates and flexibility in cost allocation is creating significant additional costs and delivery uncertainty. The Government must ensure clear and consistent allocation of responsibilities that cover all aspects of energy system change. These will not all rest with Ofgem. For example, it may be appropriate to mandate local authorities to upgrade buildings and other local infrastructure. However, it would allow Ofgem to ensure licensees, such as an FSO, are given clear responsibilities that complement any direct statutory mandates.

Decisions about which organisations undertake different aspects of delivery should be based on operational effectiveness and efficiency. Duplication should be avoided, and alignment ensured through consistency in the delivery mandates. The proposed delivery responsibilities for the FSO are limited and focused narrowly on matters relating to power system operation and associated markets. There are no obvious synergies between this activity and other operational requirements, although it may be sensible to rationalise market operation functions within a single independent market operator (which may, or may not, be within the FSO organisational structure).

Whilst the delivery responsibilities currently undertaken by the ESO represent a small proportion of overall consumer costs, this is likely to increase as more services are required to balance supply and demand and maintain system stability in a so-called ‘inverter-based system’<sup>2</sup>. These responsibilities in future will rest with the FSO and it may be necessary to set targets (either directly or via Ofgem licence requirement) for the procurement of flexibility and other system services ahead of need to prevent shortages that lead to price hikes and/or excessive curtailment of renewable electricity<sup>3</sup>.

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<sup>1</sup> Market operations functions are required and are undertaken by the Low Carbon Contracts Company

<sup>2</sup> Where large rotating turbomachinery is no longer available to provide system services

<sup>3</sup> There is much current attention on the impact of gas prices on consumers. As the need for fossil fuels reduces and becomes less predictable, the risks of supply/demand imbalances will increase. This suggests that gas storage capacity should be mandated to reduce the risks of undersupply and excessive prices.

## Implications for FSO decision support functions

There is not the time or money available to establish an infrastructure that retains the option to pursue all pathways to net zero. Big choices will need to be made soon<sup>4</sup>. These choices will have significant implications across society and should be made by Government and enshrined in delivery mandates as appropriate.

How these choices are made is the most important issue for net zero delivery. The process must be technically robust and command wide public support and, if correctly implemented, will ensure a coherent change process across the energy system.

There are three key elements in the process for making these choices:

- > Assumptions – what we believe about the future, especially relating to technology costs and deployment potentials
- > Modelling – ensuring we design an energy system that efficiently meets all requirements
- > Decision support – the process by which analysis is converted into strategic decisions

E3G has previously argued for an independent, science-based advisory body that we call the ‘Clean Economy Observatory’<sup>5</sup>. The objective of the new organisation<sup>6</sup> would be to provide authoritative views on future costs and deployment potentials of the full range of resources required to deliver net zero (the ‘assumptions’). This would include the key uncertainties around these projections and how uncertainties can be effectively managed, including through targeted investment in research and innovation. Importantly, delivery bodies would be obliged to adopt these assumptions unless there is clear evidence that specific circumstances require an alternative approach.

Politicians will inevitably face pressures that risk stalling or slowing the transition – such as the Covid-19 public health crisis. A non-political expert body can be extremely useful in providing the scientific and economic arguments to help citizens, local and national politicians and policymakers alike understand the importance of the choices available and of taking the necessary decisions when required. This will reduce uncertainty for industry and provide the maximum time possible to adapt to new laws and regulations. It will be able to take a long-term view on the technology risks and opportunities and recommend actions that are necessary now to avoid the need for disruptive and expensive future changes in direction. An independent, expert, risk-managed approach to policymaking will help protect society and the economy from the shocks and disruptions of poorly anticipated risks and help them to be ready to quickly take advantage of emerging opportunities. Maintaining policy consistency will promote stability in the long-term direction of travel for the economy and provide the best possible environment for industrial investment by lowering risk and the cost of capital.

The government recognises the need for robust technical expertise to underpin policy making. It has indicated that the FSO could provide the long-term solution for issues relating to the energy system, with the need to develop its own capability to support strategic decision making as an interim measure. However, this is a critical role that requires independence, deep knowledge, and the absence of implicit

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<sup>4</sup> The most obvious example is in the heating market where it will not be possible to retain the option both for electrification and hydrogen.

<sup>5</sup> Regulating the new energy paradigm, E3G Briefing, Simon Skillings and Lisa Fischer, June 2020

<sup>6</sup> Note that this could be an evolution of existing bodies such as the Committee on Climate Change rather than an entirely new organisation

technology bias. The FSO could only advise on energy-related issues and would inherit expertise which reflects current energy system operation.

Other important functions of such an institution would be:

1. Acting as a 'learning body', responsible for knowledge sharing to ensure that the latest information is available to all. It would constantly monitor progress with research, innovation, and deployment of technologies that businesses must understand. It would present the opportunity to level-up knowledge of technical issues, thereby improving competitiveness for industry regardless of where it is based.
2. Identifying where action is required to support the deployment of developed technologies and where innovation is required to solve challenges for which there are currently no cost-effective solutions. A focus on innovation will ensure that funds are spent helping UK businesses solve the challenges of transitioning to a net zero future.
3. It would establish a clear expert view on future technology costs and deployment potentials to assess the effectiveness of policies in delivering carbon reduction targets. This would recognise inherent uncertainties and highlight where the deployment of zero carbon technologies and approaches should be progressed now and where options should be created to take advantage of future opportunities. This will ensure that those businesses with existing products that support the transition to a low carbon economy will be able to move at pace to access finance, gain scale, and develop supply chain capacity.

In other words, it could play a critical role in defining how system analysis should be used to make good strategic decisions. Current UK policy relies extensively on scenarios produced by the ESO. These represent plausible and internally consistent views of the future. Unfortunately, they only cover a few of the infinite number of possibilities and tell us little about the actions that need to be taken. A more scientific approach to decision-making is required.

The success of the Observatory would depend on its reputation for independence and technical rigour. This would need to be established through:

1. Governance/funding: The organisation should operate under a clear mandate to provide an independent view on future technology cost and deployment potentials based on best available information. Funding should be provided from public rather than private sources.
2. Transparency: There should be full transparency of the processes used to produce conclusions, including the underlying data and sources. This should provide evidence of thorough peer review of assumptions adopted.
3. Whole economy expertise: The process must include a balance of expertise to ensure equal weighting is placed on emerging and mature technologies operating in a range of market contexts. For example, input on energy system change should place strong weighting on emerging digital technologies affecting energy usage and how they interact with behavioural change. The Observatory should seek input from leading international experts to achieve this balance.

The FSO would have an important role to play in undertaking energy system modelling and should cover both gas and electricity and be extended to new system infrastructures. It would also need to work closely with system modellers in neighbouring countries given the increasing need to share resources across borders (e.g. integrated offshore grid networks). However, it should use assumptions determined through an independent and transparent process as defined above and produce the analysis that is required to support effective decision making.